

# PATENT SPECIFICATION (11)

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(21) Application No. 18400/78

(22) Filed 9 May 1978

(31) Convention Application No's 827909  
828004  
828005

(32) Filed 26 Aug 1977 in (19)



(33) United States of America (US)

(44) Complete Specification Published 3 Jun 1981

(51) INT. CL.<sup>3</sup> B62D 55/28

(52) Index at Acceptance B7H E2F2 E2K B3A 134

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## (54) APEX TRACK SHOE

(71) We, CATERPILLAR TRACTOR CO., a corporation organized and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, Illinois 61629, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

Crawler vehicles, such as tractors, frequently have to traverse soft soils, such as peat and volcanic ash, which gives rise to flotation and traction problems. In order to improve traction, so called "apex" track shoes, having a projecting ground engaging ridge, are often fitted to the links of the articulated link chain of the endless track assembly of the vehicle. Existing track shoes of this type are not always entirely satisfactory, either because they are heavy complex castings, or because of the difficulty of fitting them to conventional links having flat outer surfaces, or because the welds by means of which they are secured to the links are subjected to unacceptably high loadings during operation, or because bolts by which they are fitted to the links are not adequately protected and become difficult to remove for replacement of the track shoes.

In accordance with the present invention, a track shoe for fitting to a substantially flat outer surface of a link of an articulated link chain of an endless track assembly for a crawler vehicle, comprises a pair of side walls which diverge relatively to one another away from a common apex ridge to provide in cross section a substantially V-shaped configuration partly defining an internal cavity of substantially triangular cross section and presenting externally leading and trailing ground engaging surfaces; means forming, at least in part, a base wall for the triangular cavity, extending inwardly from the side walls, and provided with holes for receiving bolts for fastening the track shoe, in use, to a link; and apertures in both the side walls for providing access from the outside to the bolts within the cavity.

In one construction the inwardly projecting means are formed by tabs partially cut and bent

out of a respective one of the side walls thereby simultaneously providing the apertures for providing access to the bolts which pass through the holes in the tabs. In another construction a clamping means is provided which overlies portions of the side walls and clamps the side walls directly or indirectly against the respective link. In a still further construction the inwardly extending means is a solid base plate with which the side walls are integrally formed. A track shoe of this latter construction can be formed by a novel method whereby a blank providing the base plate and a pair of upstanding and laterally spaced walls is provided and the side walls are bent towards one another to provide the apex ridge. The adjacent edges of the side walls at the apex ridge can then be filled with weld material to secure the side walls together.

Some examples of track shoes constructed in accordance with the invention are illustrated in the accompanying drawings in which:—

Figure 1 is a perspective view of part of an endless track assembly comprising a plurality of track shoes fitted to the links of an articulated link chain;

Figure 2 is a bottom perspective view of one track shoe and double link of the Figure 1 assembly;

Figure 3 is a transverse cross section through the shoe and link assembly of Figure 2;

Figure 4 is a partially broken away bottom perspective view showing the track shoes and a link assembly of another track assembly;

Figure 5 is a section taken on the line V-V in Figure 4;

Figure 6 is an underneath perspective view similar to Figure 4 but of a further track assembly;

Figure 7 is a partial section taken on the line VII-VII in Figure 6;

Figure 8 is a partial section similar to Figure 7 but showing another example;

Figure 9 is an underneath perspective view of part of a further track shoe;

Figure 10 is a cross sectional view of a blank employed in the construction of the Figure 9 shoe; and,

Figure 11 is a cross sectional view showing

the construction of the Figure 9 shoe from the Figure 10 blank.

Figure 1 partially illustrates an endless track assembly 10 comprising an articulated link chain 11 having a plurality of double link assemblies 12, each secured to a respective track shoe 13. As more clearly shown in Figures 2 and 3, each track shoe comprises a pair of sidewalls 14 and 15 having a generally V-shaped configuration in cross section. Sidewalls 14 and 15 diverge away from each other from a common apex ridge 16 towards the base of the track shoe and a pair of longitudinally spaced openings 17 are formed in each sidewall.

Each opening is defined by a tab 18 which is suitably formed out of a respective sidewall to overlie a link 12. Sidewalls 14 and 15 terminate at their lower ends at lips 19 and 20, respectively, with the lips of each adjacent pair of track shoes functioning to continuously overlap each other during operation of the track assembly in a conventional manner. Each tab 18 is disposed adjacent to a respective lip and extends inwardly therefrom and from a respective sidewall, as more clearly shown in Figure 3 to form part of a base to a cavity of triangular cross section between the sidewalls 14 and 15.

Each tab 18 has a hole 21 formed there-through for receiving the shank of a bolt 22 which further extends upwardly through an aperture 23 formed through a flat bridging portion of link 12. A nut 24 is secured onto the bolt to provide fastening means securing the track shoe to the link assembly. If so desired, each lateral end of the track shoe may be formed with a trough-like crimp 25 to aid in stabilizing and increasing the tractive effort of the track shoe as well as reducing "plowing" when turning the vehicle.

Figures 4 and 5 illustrate a modified track assembly 10a wherein identical numerals to those in Figures 1 to 3 depict corresponding constructions, but with numerals depicting modified constructions being accompanied by an "a".

Track assembly 10a comprises a plurality of component track shoes 13a each having a first component forming a pair of diverging sidewalls 14a and 15a meeting at a common apex ridge 16a. A pair of openings 17a are formed through each sidewall to define bent tabs 18a extending inwardly therefrom. A second, base component 26 of the track shoe has lips 19a and 20a formed on opposite ends thereof.

A pair of laterally spaced grousers 27 are formed on the base 26 and a bolt 22a extends through a respective tab 18a a grouser 27 and the base and through a bridging portion of track link 12. A nut 24a is screwed onto the bolt to provide fastening means securing the track shoe to the link. Each portions 28 and 29 of sidewalls 14a and 15a, respectively, engage outboard sides of grousers 27 to aid in retaining

the sidewalls in position on the base 26.

Figure 6 partially illustrates an endless track assembly 110 comprising an articulated link chain 111 having a plurality of double links 112, each secured to a respective track shoe 113. As more clearly shown in Figure 7, each track shoe comprises a base plate 114 having lips 115 and 116 formed integrally on opposite sides and extending the full width thereof. The lips of each adjacent pair of track shoes function in a conventional manner to continuously overlap each other during operation of the track assembly.

A pair of laterally spaced spacer blocks 117 are mounted on base plate 114, along with a track plate 118. The track plate has an inverted V-shape and a chamfered bearing surface 119 is formed on each spacer block 117 to engage an interior surface of the track plate. Track plate 118 has an apex ridge 120 and a pair of sidewall portions 121 and 122 extending in diverging relationship relative to each other from the apex ridge.

Each sidewall has a pair of access openings 123 formed therethrough to each expose the head of a bolt 124 comprising a fastening means along with a nut 125 screwed onto an end thereof. Each bolt extends sequentially through aligned bores formed through one of a pair of clamping plates 126, disposed in straddling relationship through openings 123 and relative to track plate 118, and through a spacer block 117 and base plate 114. Each clamping plate is substantially flat and comprises bent end or clamping portions 127 and 128, each of which project downwardly towards base plate 114 to engage an outer surface of a sidewall of track plate 118 in retaining relationship therewith.

Figure 8 illustrates a modified track shoe 113a wherein identical numerals to those used in Figures 6 and 7 depict corresponding constructions, but with numerals depicting modified constructions being accompanied by an "a".

Track shoe 113a essentially differs from the Figures 6 and 7 track shoe in that spacer block 117 have been eliminated and a main body portion of a clamping plate 126a engages base plate 114 directly in bearing contact therewith. End or clamping portions 127a and 128a of the clamping plate are generally U-shaped to engage track plate 118 to retain it in secured position on link 112.

In each of the Figures 6 to 8 examples, bolts 124 could be utilized to secure each clamping plate to the base plate directly. In such an application, the clamping plates and apertures 123 therefor could be disposed outboard of links 112. In addition, separate bolts would be required to secure the base plate to the links directly.

Figure 9 partially illustrates a track shoe 210, having a triangular cross section, comprising a substantially flat base plate 211 having a pair of sidewalls 212 and 213 formed

integrally with the base. The sidewalls extend away from the base and towards each other in converging relationship to terminate at closely adjacent end portions defining an apex ridge of the track shoe. End edges of the sidewall define a V-shaped trough 214 therebetween, having a continuous weld 215 deposited therein to preferably secure the sidewalls together. Alternatively, the sidewalls could be maintained and utilized in unsecured relationship without the use of the weld or other suitable securing means.

A plurality of reinforcing bosses 216 are formed integrally on an interior surface of base 211 of the track shoe and a bore 217 is formed through each of the bosses and the base to adapt it for reception of a bolt 218. The bolt is utilized to secure the track shoe to a track link of an endless track assembly (not shown) in a conventional manner. A plurality of access apertures 219 are formed through sidewalls 212 and 213 to each overlie a respective bore 217 to provide access to the head of a bolt 218 whereby a workman can readily secure the track shoe to the link chains.

The method for making this track shoe will now be described. Figure 10 illustrates a generally U-shaped blank comprising a prefabricated base 211' and upstanding sidewalls 212' and 213', disposed in perpendicular relationship relative to the base. Although the blank is preferably cast in a conventional manner to provide bosses 216, it should be understood that the blank could likewise be roll-formed or extruded in a conventional manner. The blank is further formed with a pair of integral lips 220 and 221, disposed on opposite sides of base 211'. The lips of each adjacent pair of track shoes of an endless track assembly will function in a conventional manner to continuously overlap each other during operation thereof.

Referring to Figure 11, a pair of form rollers 222 and 223, suitably movably mounted in a conventional forming apparatus, are adapted to gradually bend and form sidewalls 212' and 213' into their final configuration whereby the track shoe exhibits a triangular cross section. Alternatively, a plurality of such rollers disposed at gradually increased inclinations relative to the line of flight of the track shoe blank could be employed to effect the bending step. Subsequent to such forming operation, it should be understood that bores 217 and access openings 219 may be suitably formed in the blank.

Upon final bending of sidewalls 212 and 213 to their Figure 11 dispositions to place edges 214 thereof in close proximity, weld 215 (Figure 9) may be deposited in V-shaped groove 214, defined by such edges, to secure the sidewalls together as suggested above, the weld could be omitted to maintain the sidewalls in unsecured relationship relative to each other. The completed track shoe is thus adapted for securance to the link assembly of an endless

track assembly by means of bolts 218 and nuts (not shown) screwed thereon.

#### WHAT WE CLAIM IS:—

1. A track shoe for fitting to a substantially flat outer surface of a link of an articulated link chain of an endless track assembly for a crawler vehicle, the track shoe comprising a pair of side walls which diverge relatively to one another away from a common apex ridge to provide in cross section a substantially V-shaped configuration partly defining an internal cavity of substantially triangular cross section and presenting externally leading and trailing ground engaging surfaces; means forming, at least in part, a base wall for the triangular cavity, extending inwardly from the side walls, and provided with holes for receiving bolts for fastening the track shoe, in use, to a link; and apertures in both the side walls for providing access from the outside to the bolts within the cavity.
2. A track shoe according to Claim 1, wherein the inwardly extending means is formed integrally with the side walls.
3. A track shoe according to Claim 2, wherein the inwardly extending means comprises a number of tabs which are each partially cut and bent inwards from a respective one of the side walls thereby also producing in the side wall a respective aperture.
4. A track shoe according to any one of the preceding claims, wherein a lip project outwardly along the edge of each side wall remote from the apex ridge, each lip being arranged to lap a complementary lip of an adjacent track shoe in use.
5. A track shoe according to Claim 4, wherein each lip is integrally formed with the respective side wall.
6. A track shoe according to Claim 4, wherein the lips are formed on a base plate which is arranged in use to be clamped between the side walls and a link to which the track shoe is in use fitted.
7. A track shoe according to Claim 6, when dependent upon Claim 3, wherein the base plate is provided with a pair of spaced grousers and the tabs rest on respective ones of the grousers.
8. A track shoe according to Claim 7, wherein the side walls abut against the sides of respective ones of the grousers.
9. A track shoe according to Claim 1, wherein the inwardly extending means comprises a separate clamping means which overlies a portion of each of the side walls.
10. A track shoe according to Claim 9, wherein the clamping means extends outwardly through the apertures and hooks over portions of the side walls at edges of the apertures.
11. A track shoe according to Claim 9 or Claim 10, wherein a lip extends outwardly from the edge of each side wall remote from the apex ridge, each lip being arranged to lap a complementary lip on an adjacent track shoe in use, and the lips being formed on a base plate which

is arranged to be clamped in use between the side walls and a link to which the track shoe is fitted.

12. A track shoe according to Claim 1, wherein the inwardly extending means is a solid base plate formed integrally with the side walls.

13. A track shoe according to Claim 12, wherein the edges of the side walls which meet at the apex ridge are secured together by a longitudinal weld.

14. A track shoe according to Claim 12 or Claim 13, wherein the holes are provided in raised bosses on the base plate.

15. A track shoe according to any one of Claim 12 to 14, wherein an integral lip extends outwardly from the edge of each side wall remote from the apex ridge, each lip being arranged in use to lap a complementary lip of an adjacent track shoe.

16. A track shoe according to any of the preceding claims, wherein each lateral end of the track shoe is formed with a trough-like crimp.

17. A track shoe according to Claim 1, substantially as described with reference to any one of the examples illustrated in Figures 1 to 8 of the accompanying drawings.

18. A track shoe according to Claim 1, substantially as described with reference to Figures 9 to 11 of the accompanying drawings.

19. An endless track assembly for a crawler vehicle, the assembly comprising an articulated

link chain to the links of which are bolted a plurality of track shoes according to any one of the preceding claims,

20. A method of making a track shoe according to any one of Claims 12 to 16, or Claim 18, the method comprising the steps of forming a blank incorporating the base plate and a pair of upstanding and laterally spaced side walls, and bending the side walls towards each other to form the apex ridge.

21. A method according to Claim 20, wherein the edges of the side walls which are brought adjacent to one another at the apex ridge are secured together by welding.

22. A method according to Claim 21, wherein the step of bending the side walls towards one another produces a V-shaped groove therebetween at the apex ridge.

23. A method according to Claim 20, substantially as described with reference to Figure 9 to 11 of the accompanying drawings.

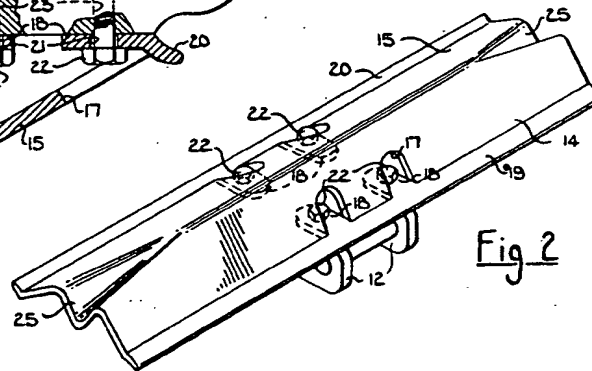
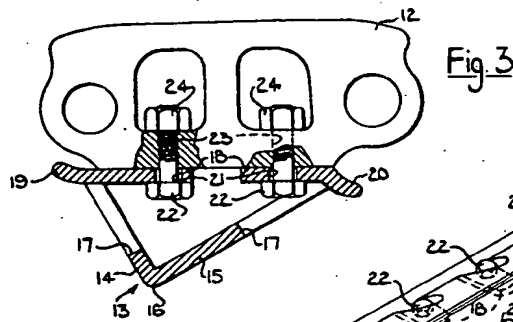
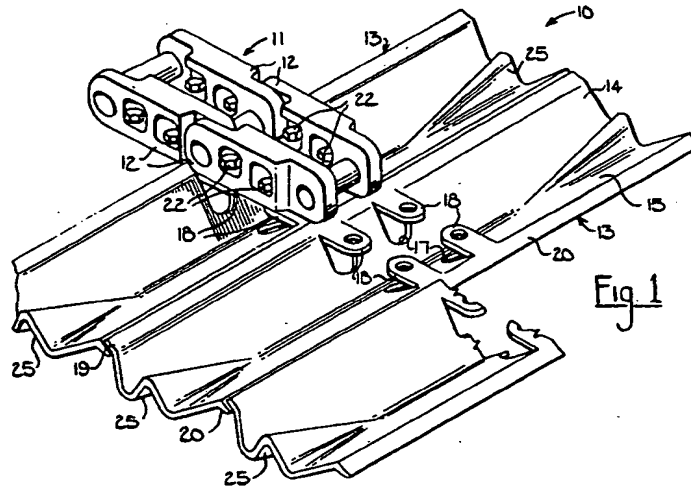
24. A track shoe which has been formed by a method according to any one of Claims 20 to 23.

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Sheet 2

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Sheet 2

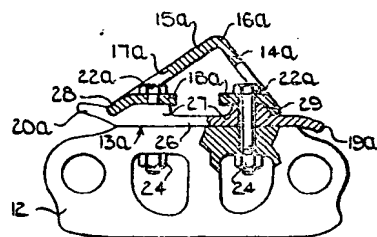
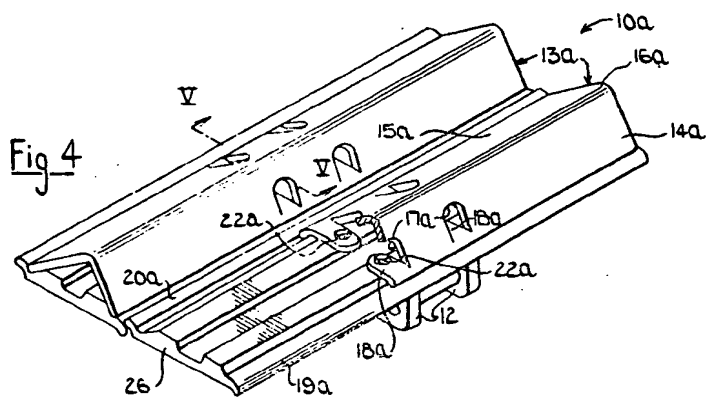


Fig 5

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Sheet 3

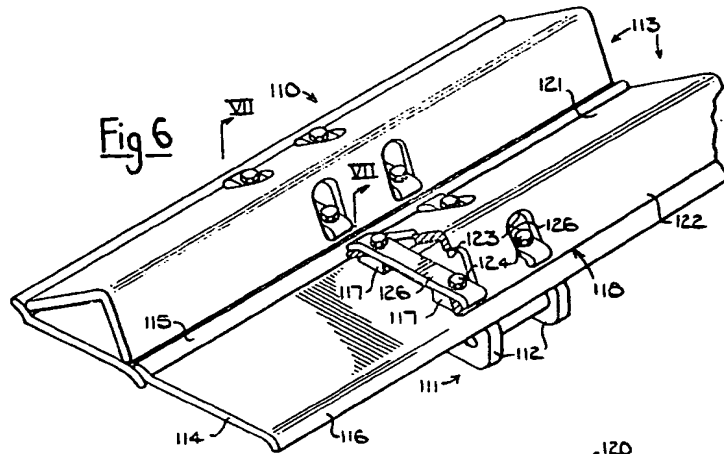


Fig 7

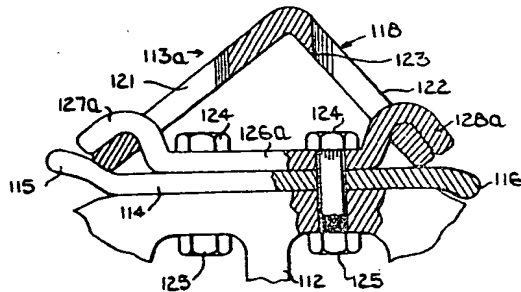
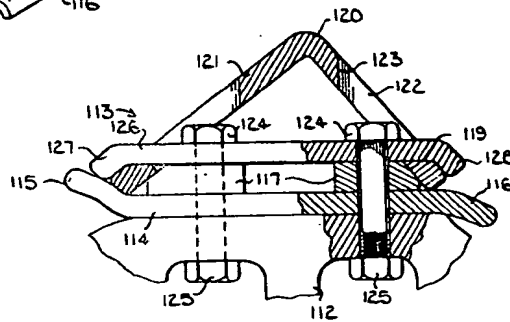


Fig 8

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